

AstroCube: An Asteroid Prospecting CubeSat Mission, Phase I

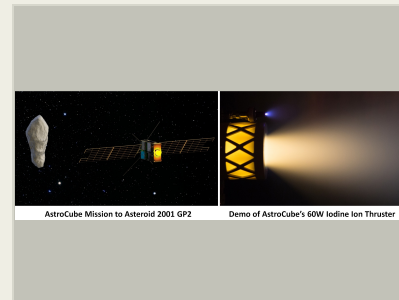
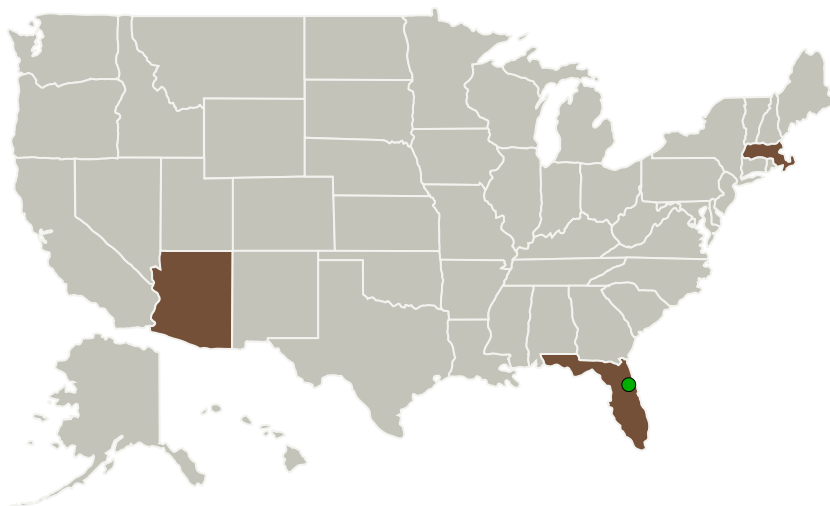
Completed Technology Project (2016 - 2017)



Project Introduction

Busek, in partnership with Arizona State University (ASU), proposes to develop a robotic resource prospecting mission to a near-Earth asteroid using a 6U CubeSat, nicknamed "AstroCube". This ambitious mission is enabled by Busek's iodine-fueled BIT-3 RF ion propulsion system that can deliver $\sim 1\text{mN}$ of thrust and $\sim 2200\text{sec}$ of total Isp with 65W nominal input power. With 1.6kg of solid iodine propellant onboard, the BIT-3 thruster will provide AstroCube approximately 3.1km/s of delta-V maneuverability to rendezvous with the target, Asteroid 2001 GP2, during its next closest Earth approach in October 2020. The 6U CubeSat platform is chosen due to its low cost and ease of access to ride-share opportunity on GEO-bound upper stages, as well as on the upcoming NASA SLS demonstration missions. The AstroCube mission will leverage a unique deep-space 6U CubeSat bus with ion propulsion, currently being co-developed by Busek and Morehead State University (MSU) under NASA's Lunar IceCube flight program. The proposed mission will encompass several technology innovations, including compact science instruments and autonomous CONOPS, which are the focus of this Phase I development. A rad-tolerant, 1/4U sized camera-Lidar device will give AstroCube "eyes" to survey the asteroid and help with proximity navigation. Due to the asteroid's weak gravitational field, the spacecraft will be required to use real-time depth image processing and its ion thruster to navigate around the asteroid during final approach to a low stationary altitude. Once such close proximity is reached, a 1U sized neutron spectrometer will be activated to characterize the abundance of hydrogen, which would indicate presence of water ice, by detecting slow-moving neutrons as they scatter off the asteroid's regolith from the bombardment of cosmic rays.

Primary U.S. Work Locations and Key Partners

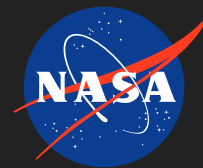


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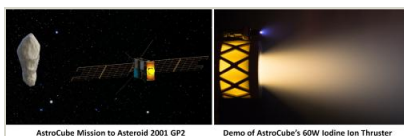
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Organizations Performing Work	Role	Type	Location
Busek Company, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Natick, Massachusetts
Arizona State University-Tempe(ASU)	Supporting Organization	Academia Alaska Native and Native Hawaiian Serving Institutions (ANNH)	Tempe, Arizona
 Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Primary U.S. Work Locations

Arizona	Florida
Massachusetts	

Images



Briefing Chart Image

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(<https://techport.nasa.gov/image/132316>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Busek Company, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

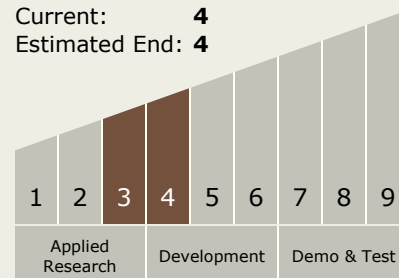
Carlos Torrez

Principal Investigator:

Michael Tsay

Technology Maturity (TRL)

Start: 3
Current: 4
Estimated End: 4



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Technology Areas

Primary:

- TX07 Exploration Destination Systems
 - └ TX07.1 In-Situ Resource Utilization
 - └ TX07.1.1 Destination Reconnaissance and Resource Assessment

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System